GEORGIA INSTITUTE OF TECHNOLOGY

OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[X] ORIGINAL

[ ] REVISION NO. ____

Project No. A-2998

DATE: 7/20/81

Project Director: ~~Mr. C. T. Wallace~~ J.D. Knight

~~School~~/Lab EML/RSD

Sponsor: U. S. Army Missile Command; Redstone Arsenal, AL 35898

Type Agreement: Delivery Order No. 0022 under Contract No. DAAH01-81-D-A003

Award Period: From 7/2/81 To ~~9/30/81~~ 7/31/82 (Performance) ~~11/30/81~~ 12/31/82 (Reports)

Sponsor Amount: $120,000 ~~$120,000~~

Contracted through: GTRI/~~GIT~~

Cost Sharing: None

Title: Systems Analysis

ADMINISTRATIVE DATA

OCA CONTACT Duane Hutchison x 4820

1) Sponsor Technical Contact: Dr. M. M. Hallum; Systems Simulation and Development Directorate; U. S. Army Missile Command; Attn: DRSMI-RDF; Redstone Arsenal, AL 35898 205/ 876-4141

2) Sponsor Admin./Contractual Contact: Mr. Thomas A. Bryant; ONR Resident Representative; Georgia Institute of Technology; 206 O'Keefe Building; Atlanta, GA 30332.

Reports: See Deliverable Schedule

Security Classification: Unclassified

Defense Priority Rating: DO-A2 under DMS Reg. 1

RESTRICTIONS

See Attached DOD Supplemental Information Sheet for Additional Requirements

Travel: Foreign travel must have prior approval - Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with Government; except that items costing less than $1,000 vests with GIT if prior approval to purchase is obtained from the Contracting Officer.

COMMENTS:

COPIES TO:

Administrative Coordinator
Research Property Management
Accounting Office
Research Security Services
Reports Coordinator (OCA)
Legal Services (OCA)
EES Research Public Relations
Project File (OCA)
Other: Mr. Wallace-Huntsville

GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION SHEET

Date 6-10-83

Project Title: SYSTEMS ANALYSIS

Project No: A 2998

Project Director: J. D. Knight

Sponsor: U. S. Army Missile Command

Effective Termination Date: 7-31-82

Clearance of Accounting Charges: 7-31-82

Grant/Contract Closeout Actions Remaining:

- [X] Final Invoice and Closing Documents
- [ ] Final Fiscal Report
- [X] Final Report of Inventions
- [X] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other _____

Assigned to: EML (School/Laboratory)

COPIES TO:

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Accounting	Legal Services (OCA)	Project File
Procurement/EES Supply Services	Library	Other Project Director

A-2998

Monthly Technical Report No. 1
and
Monthly Cost and Performance Report No. 1

Report Period
July 2, 1981 through July 31, 1981

SYSTEM ANALYSIS

C. T. Wallace, Jr.

Contract No. DAAH01-81-D-A003
Delivery Order No. 0022

Project No. A-2998

Prepared for

U. S. Army Missile Command
Attn: DRSMI-IYB/Morris
Redstone Arsenal, Alabama 35898

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS PERIOD

This, the first monthly technical cost and performance report, will collect and summarize both the work done during the period and precursor activities.

The activity associated with the Phase III effort has been going on since early April 1980. The substantial delay in the turn-on of the delivery order resulted from the fact that funding was withheld pending resolution of differences between Raytheon, the prime contractor, the Hawk Project Office and the principal user facility, USAADS, at Ft. Bliss. Georgia Tech's involvement in support of these acitivites has been at a sustaining level from the outset of the program and has supported MICOM at all appropriate meetings with the contractor, Project Office and other interested parties. On April 27 - 30 a meeting was held in Bedford, MA to discuss the introductory status of the PIPs and enable Raytheon to begin to write the statement of work (SOW) and various specification documents in preparation for the submission of the request to begin design work. This meeting was supported by Georgia Tech personnel. Subsequent meetings involving specification and SOW reviews in May and June have also been supported.

Familiarization with the existing Improved Hawk (IH) simulator has occupied a large portion of time expended in preparation for this study. It is expected that as a part of the final output, a set of digital simulations of the LASHE mode will be performed. As a result of simulator study, a concerted effort to shorten the execution time has been implemented by such devices as:

1) consolidating/eliminating subroutines
2) shifting calculations out of fast-loop execution where possible
3) coding in-line functions for system subroutine calls
4) optimizing code consistent with latest complier options

The results of these efforts are inconclusive at present but the general simulator scrub is continuing.

WORK PLANNED

- Continue support of Phase III planning and specification preparation
- Continue general redefinition of present IH simulator to LASHE configuration
- Develop a target wreckage/damage model for LASHE applications
- Continue simulator timing improvements

PROBLEMS

None

Cost Information

The following charges have been incurred against the contract during period July 2 through July 31, 1981.

	Expended	Encumbered
Personal Services (PS)	$ 906.16	$ -0-
Materials and Supplies	-0-	-0-
Travel	-0-	-0-
Retirement (@ 11.11% of PS)	100.68	-0-
Overhead (@ 55% of above categories)	553.76	-0-
TOTAL	$ 1,560.60	$ -0-

The breakdown of personal services is as follows:

	Dollars	Approximate Man Hours
Principal Research Scientists/Engineers	$ 141.11	3
Senior Research Scientists/Engineers	765.05	21
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	-0-	-0-
Secretarial/Clerical/Other	-0-	-0-
TOTAL	$ 906.16	24

The current financial status of the contract is as follows:

	Budget As Proposed	Expended	Encumbered	Free Balance
Personal Services (PS)	$ 60,440.02	$ 906.16	$ -0-	$ 59,533.86
Materials and Supplies	664.50	-0-	-0-	664.50
Travel and Shipping	10,000.00	-0-	-0-	10,000.00
Computer	-0-	-0-	-0-	-0-
Overhead	42,581.00	553.76	-0-	42,027.24
Retirement	6,314.48	100.68	-0-	6,213.80
FUNDING	$ 120,000.00	$ 1,560.60	$ -0-	$118,439.40

Based on present full funding, the funding and equivalent man hours are sufficient to complete the task. Approximately 1% of the proposed task has been completed.

A-2998

Monthly Technical Report No. 2
and
Monthly Cost and Performance Report No. 2

Report Period
August 1, 1981 through August 31, 1981

SYSTEM ANALYSIS

C. T. Wallace, Jr.

Contract No. DAAH01-81-D-A003
Delivery Order No. 0022

Project No. A-2998

Prepared for

U. S. Army Missile Command
Attn: DRSMI-IYB/Morris
Redstone Arsenal, Alabama 35898

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS PERIOD

In preparation for a meeting held in Huntsville August 13-14, the Phase III PIP Type A specification was reviewed in detail and the comments forwarded to the technical interface, Mr. Ron Davis. At this meeting current status of the Phase III effort was presented by the contractor, Raytheon. Information relative to the simulations under development was presented and specifics were requested concerning the LASHE antenna pattern and current status of the Raytheon damage models.

Two preliminary LASHE scenarios have been defined and implemented. Both of these incorporate the rudimentary damage model as an integral part of the simulation. Refinements will be added in the coming months.

The bulk of the simulator timing improvements have been completed. The net result is an approximate ten percent overall savings in execution time and a twenty-five percent savings in compilation time for each simulation run. The specifics are documented in Georgia Tech Memo No. HSV-81-255.

WORK PLANNED

In the upcoming month, the LASHE scenarios including the damage model will be investigated. Parameterization of the damage model will be attempted in order to quantify assumed behavior which was not directly supported by firm flight tests or hardware-in-the-loop simulations. Specifics of the Raytheon damage mode have been requested through the technical monitor, Mr. Ron Davis. A meeting with Dr. Maurice Long, who is under contract as a consultant in these matters, is planned to discuss the damage model, possible improvements to it, and other matters affecting modeling of the LASHE scenario.

PROBLEMS

None

Cost Information

The following charges have been incurred against the contract during period August 1 through August 31, 1981.

	Expended	Encumbered
Personal Services (PS)	$ 1,112.80	$ -0-
Materials and Supplies	-0-	-0-
Travel	-0-	-0-
Retirement (@ 11.11% of PS)	123.63	-0-
Overhead (@ 55% of above categories)	680.04	-0-
TOTAL	$ 1,916.47	$ -0-

The breakdown of personal services is as follows:

	Dollars	Approximate Man Hours
Principal Research Scientists/Engineers	$ -0-	-0-
Senior Research Scientists/Engineers	1,112.80	30
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	-0-	-0-
Secretarial/Clerical/Other	-0-	-0-
TOTAL	$ 1,112.80	30

The current financial status of the contract is as follows:

	Budget As Proposed	Expended	Encumbered	Free Balance
Personal Services (PS)	$ 60,440.02	$ 2,018.96	$ -0-	$ 58,421.06
Materials and Supplies	664.50	-0-	-0-	664.50
Travel and Shipping	10,000.00	-0-	-0-	10,000.00
Computer	-0-	-0-	-0-	-0-
Overhead	42,581.00	1,233.80	-0-	41,347.20
Retirement	6,314.48	224.31	-0-	6,090.17
FUNDING	$ 120,000.00	$ 3,477.07	$ -0-	$116,522.93

Based on present full funding, the funding and equivalent man hours are sufficient to complete the task. Approximately 3% of the proposed task has been completed.

A-2998

Monthly Technical Report No. 3
and
Monthly Cost and Performance Report No. 3

Report Period
September 1 through September 30, 1981

SYSTEM ANALYSIS

C. T. Wallace, Jr.

Contract No. DAAH01-81-D-A003
Delivery Order No. 0022

Project No. A-2998

Prepared for

U. S. Army Missile Command
Attn: DRSMI-IYB/Morris
Redstone Arsenal, Alabama 35898

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS PERIOD

Specific information for the construction of a damage model for treating the debris resulting from a missile/aircraft intercept has yet to be obtained from the prime contractor. As a result, a simplified model has been built and incorporated into the simulation locally. This model assumes that upon intercept and destruction of a target that the noise level at the sensor is increased markedly and that the destroyed target begins to follow some trajectory which can be described by a fourth order polynomial in time. Based on one flight for which we have HPI data where a similiar situation occurred, the noise level was determined to increase 20 dBm above the nominal noise level and debris pieces were observed to disappear from the Fourier Analyzer plots indicating that they had disappeared from the frequency spectrum swept by the missiles speed gate in less than 2 seconds. It appeared that the duration of the blast which raised the noise level significantly was the primary parameter of interest in this model. Several values for blast duration ranging from 0.1 to 1.5 seconds were chosen for investigation. In each case it was found that the missile lost synchronous lock and began to resweep; however, in every case it reacquired its initial target and achieved a miss distance insignificantly different from the nominal miss distance under nominal conditions. From this simple model it may be concluded that the missile will successfully intercept a target despite the presence of blast-generated noise which temporarily obscures the target.

On September 10-11, Dr. Maurice Long, consultant on this project, was here to discuss the debris model definition and the clutter mechanisms resulting from multipath scattering of the illuminating antenna. Progress toward the understanding of the latter was made, and some refinements were defined for use in the clutter modeling digital simulation program. The debris model was discussed and Dr. Long agreed to seek refinements to it also.

WORK PLANNED

In the upcoming month, the subject of "look down", an ECCM technique peculiar to the LASHE MODE, will be studied and an attempt made to simulate the effects of flying a missile with this technique implemented.

Refinements to the digital clutter simulation will be incorporated and this model used to study the clutter mechanisms extant to the LASHE mode.

Another visit from the consultant Dr. Long, is planned for the October 21-23 time frame.

PROBLEMS

None

Cost Information

The following charges have been incurred against the contract during period September 1 through September 30, 1981.

	Expended	Encumbered
Personal Services (PS)	$ 5,117.94	$ -0-
Materials and Supplies	501.57	-0-
Travel	-0-	-0-
Retirement (@ 11.11% of PS)	568.61	-0-
Overhead (@ 55% of above categories)	3,403.37	-0-
TOTAL	$ 9,591.49	$ -0-

The breakdown of personal services is as follows:

	Dollars	Approximate Man Hours
Principal Research Scientists/Engineers	$ 235.18	5
Senior Research Scientists/Engineers	4,882.76	130
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	-0-	-0-
Secretarial/Clerical/Other	-0-	-0-
TOTAL	$ 5,117.94	135

The current financial status of the contract is as follows:

	Budget As Proposed	Expended	Encumbered	Free Balance
Personal Services (PS)	$ 60,440.02	$ 7,136.90	$ -0-	$ 53,303.12
Materials and Supplies	664.50	501.57	-0-	162.93
Travel and Shipping	10,000.00	-0-	-0-	10,000.00
Overhead	42,581.00	4,637.27	-0-	37,943.73
Retirement	6,314.48	792.92	-0-	5,521.56
FUNDING	$ 120,000.00	$ 13,068.66	$ -0-	$106,931.34

Based on present full funding, the funding and equivalent man hours are sufficient to complete the task. Approximately 10% of the proposed task has been completed.

A-2998

Monthly Technical Report No. 4
and
Monthly Cost and Performance Report No. 4

Report Period
October 1, through October 31, 1981

Report Prepared
December 8, 1981

SYSTEM ANALYSIS

J. D. Knight

Contract No. DAAH01-81-D-A003
Delivery Order No. 0022
Project No. A-2998

Effective Date: 7/21/81
Expiration Date: 7/31/82
Expiration Date: 9/30/82

Prepared for

U. S. Army Missile Command
Attn: DRSMI-IYB/Morris
Redstone Arsenal, Alabama 35898

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PLANNED

- Continue Look-Down Clutter Investigation using the RF Simulation Including Sidelobe Modeling
- Continue Look-Down Missile Performance using the Digital Simulation (Benign and ECM environments)
- Continue Debris Study
- Continue Synchronous Detector and Jammer Modeling
- Continue Clutter Investigation for the LASHE Design Parameters
- Support RFSS Tests

WORK PERFORMED DURING THIS PERIOD

There has been no additional data to support debris model updates. An outline for testing has been completed to determine the simulation matrix for this study.

Several additional modeling requirements have been defined since the debris model was added to the missile system simulation. Specifically a synchronous detector model to determine boresight tracking guidance information is required since the information from the synchronous and envelope detectors is significantly different when multiple RF returns are present. An analysis of the hardware has begun in concert with requirements on related task orders. Additional modeling is also required when noise jammers cause acquisition delays and contributions to the indicated boresight angle. RFSS tests are to be conducted and analyzed to determine these models. Some previous runs have indicated potential influence for large jamming powers.

In addition to modeling updates, the look down features of the Phase III are being investigated. A feature to remove head procession rate and bias the line of sight from the normal viewing has been added to the digital and RF simulation programs. A study is underway based on current antenna and electronic processing modeling.

A study of clutter mixing mechanisms and a comparisons between normal, LASHE, and LASHE look-down modes has been completed and results given to the customer.

PROBLEMS

None

Cost Information

The following charges have been incurred against the contract during period October 1 through October 31, 1981.

	Expended	Encumbered
Personal Services (PS)	$ 5,570.82	$ -0-
Materials and Supplies	5,614.08	7,500.00
Travel	-0-	-0-
Retirement (@ 11.59% of PS)	484.09	-0-
Overhead (@ 55% of above categories)	6,417.94	-0-
TOTAL	$ 18,086.93	$ 7,500.00

The breakdown of personal services is as follows:

	Dollars	Approximate Man Hours
Principal Research Scientists/Engineers	$ 470.35	18
Senior Research Scientists/Engineers	3,706.47	171
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	1,394.00	249
Secretarial/Clerical/Other	-0-	-0-
TOTAL	$ 5,570.82	438

The current financial status of the contract is as follows:

	Budget As Proposed	Expended	Encumbered	Free Balance
Personal Services (PS)	$ 60,440.02	$ 12,707.72	$ -0-	$ 47,732.30
Materials and Supplies	664.50	6,115.65	7,500.00	-12,951.15
Travel and Shipping	10,000.00	-0-	-0-	10,000.00
Overhead	42,581.00	11,055.21	-0-	31,525.79
Retirement	6,314.48	1,277.01	-0-	5,037.47
FUNDING	$ 120,000.00	$ 31,155.59	$ 7,500.00	$ 81,344.41

Based on present full funding, the funding and equivalent man hours are sufficient to complete the task. Approximately 26% of the proposed task has been completed.

A-2998

Monthly Technical Report No. 5
and
Monthly Cost and Performance Report No. 5

Report Period
November 1, through November 30, 1981

Report Prepared
December 17, 1981

SYSTEM ANALYSIS

J. D. Knight

Contract No. DAAH01-81-D-A003
Delivery Order No. 0022
Project No. A-2998

Effective Date: 7/21/81
Expiration Date: 7/31/82 (Original)
Expiration Date: 9/30/82 (Modification)

Prepared for

U. S. Army Missile Command
Attn: DRSMI-IYB/Morris
Redstone Arsenal, Alabama 35898

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS PERIOD

An additional flight tape for destruction of one of two targets is being processed to provide additional data for the debris model.

A cursory model of the synchronous detector model for specular and noise jammers has been added to the digital simulation and successful simulation runs are being analyzed for target and SOJ scenarios. This model will be integrated with another model for the synchronous detector which was developed on a separate task for multiple skin returns. Acquisition delays have also been modeled and three cases are attached to this report for the Lashe Look-down mode. RFSS tests have been completed and provide the data necessary for the understanding of these models.

A prediction RF program for analysis of clutter and clutter mixing has been completed for Lashe and Lashe Look-down, normal Hawk and Hawk Look-down. This RF simulation will be used to predict comparison clutter for those modes.

PROBLEMS

None

WORK PLANNED

- Continue Look-Down Clutter Investigation using the RF Simulation Including Sidelobe Modeling
- Continue Look-Down Missile Performance using the Digital Simulation (Benign and ECM environments)
- Continue Debris Study
- Continue Synchronous Detector and Jammer Modeling
- Continue Clutter Investigation for the LASHE Design Parameters
- Support RFSS Tests

Cost Information

The following charges have been incurred against the contract during period November 1 through November 30, 1981.

	Expended	Encumbered
Personal Services (PS)	$ 858.47	$ -0-
Materials and Supplies	8.30	-0-
Travel	1,114.54	-0-
Retirement (@ 11.59% of PS)	8.40	-0-
Overhead (@ 55% of above categories)	1,094.34	-0-
TOTAL	$ 3,084.05	$ -0-

The breakdown of personal services is as follows:

	Dollars	Approximate Man Hours
Principal Research Scientists/Engineers	$ -0-	-0-
Senior Research Scientists/Engineers	-0-	-0-
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	786.00	128
Secretarial/Clerical/Other	72.47	10
TOTAL	$ 858.47	138

The current financial status of the contract is as follows:

	Budget As Proposed	Expended	Encumbered	Free Balance
Personal Services (PS)	$ 60,440.02	$ 13,566.19	$ -0-	$ 46,873.83
Materials and Supplies	664.50	6,123.95	7,500.00	-12,959.45
Travel and Shipping	10,000.00	1,114.54	-0-	8,885.46
Overhead	42,581.00	12,149.55	-0-	30,431.45
Retirement	6,314.48	1,285.41	-0-	5,029.07
FUNDING	$ 120,000.00	$ 34,239.64	$ 7,500.00	$ 78,260.36

Based on present full funding, the funding and equivalent man hours are sufficient to complete the task. Approximately 35% of the proposed task has been completed.

A-2998

Monthly Technical Report No. 6
and
Monthly Cost and Performance Report No. 6

Report Period
December 1 through December 31, 1981

Report Prepared
February 3, 1982

SYSTEM ANALYSIS

J. D. Knight

Contract No. DAAH01-81-D-A003
Delivery Order No. 0022
Project No. A-2998

Effective Date: 7/21/81
Expiration Date: 7/31/82
Expiration Date: 9/30/82

Prepared for

U. S. Army Missile Command
Attn: DRSMI-IYB/Morris
Redstone Arsenal, Alabama 35898

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS PERIOD

A presentation of the Look Down and SOJ Studies was made to the Project Office. This included comparisons between RFSS and digital simulations. Additional modeling was required by the digital simulation to match the RFSS. The modeling required was a divergence from traditional concepts and requires further insight into the problem. Thus, a task to define detector modeling was initiated by Dr. Maurice Long. Parallel activities are being performed by RAIL Laboratory. Some of Barton's multipath studies have exhibited a similiar discrepency.

The RF simulation program is being run for each available LFP trajectory. Comparisons between flight and RF simulation results are being made for all modes. These initial studies have indicated the importance of calculation of the feedthrough return. At least three distinct mechanisms have been identified. Further studies are required. Each mode (Normal, Normal LD, LASHE and LASHE LD) is being investigated.

Additional flight data will be analyzed for debris modeling.

The importance of the LASHE antenna design specifications and actual performance have been stressed during a review of the Project Office/Contractor agreements.

PROBLEMS

None

WORK PLANNED

- Continue Digital/RFSS Simulation Comparisons
- Continue LD Investigation
- Continue Debris Analysis for Modeling Updates
- Continue Detector Modeling for Multiple Returns
- Continue Site Dependency/Clutter Investigations
- Support RFSS Testing

Cost Information

The following charges have been incurred against the contract during period December 1 through December 31, 1981.

	Expended	Encumbered
Personal Services (PS)	$ 1,022.42	$ -0-
Materials and Supplies	8,024.02	12,487.63
Travel	53.39	-0-
Retirement (@ 11.59% of PS)	12.54	-0-
Overhead (@ 55% of above categories)	5,011.80	-0-
TOTAL	$ 14,124.17	$ 12,487.63

The breakdown of personal services is as follows:

	Dollars	Approximate Man Hours
Principal Research Scientists/Engineers	$ -0-	-0-
Senior Research Scientists/Engineers	-0-	-0-
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	914.28	149
Secretarial/Clerical/Other	108.14	15
TOTAL	$ 1,022.42	164

The current financial status of the contract is as follows:

	Budget As Proposed	Expended	Encumbered	Free Balance
Personal Services (PS)	$ 60,440.02	$ 14,588.61	$ -0-	$ 45,851.41
Materials and Supplies	664.50	14,147.97	19,987.63	-33,471.10
Travel and Shipping	10,000.00	1,167.93	-0-	8,832.07
Overhead	42,581.00	17,161.35	-0-	25,419.65
Retirement	6,314.48	1,297.95	-0-	5,016.53
FUNDING	$ 120,000.00	$ 48,363.81	$ 19,987.63	$ 51,648.56

Based on present full funding, the funding and equivalent man hours are sufficient to complete the task. Approximately 57% of the proposed task has been completed.

A-2998

Monthly Technical Report No. 7
and
Monthly Cost and Performance Report No. 7

Report Period
January 1 through January 31, 1982

Report Prepared
February 18, 1982

SYSTEM ANALYSIS

J. D. Knight

Contract No. DAAH01-81-D-A003
Delivery Order No. 0022
Project No. A-2998

Effective Date: 7/21/81
Expiration Date: 7/31/82
Expiration Date: 9/30/82 (Mod 1)

Prepared for

U. S. Army Missile Command
Attn: DRSMI-IYB/Morris
Redstone Arsenal, Alabama 35898

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS PERIOD

Dr. M. Long and Don Lewinski (RAIL) presented findings of a detector modeling study. Subsequent entries in RFSS were used to verify findings. Some further RFSS tests will be made to validate digital modeling and to provide further insight into the complex threat environment.

Threat definitions are being reviewed and incorporated into the Phase III study. A digital test plan is being devised. Preparation is being made for future Phase III entries.

The RF simulation program was updated to include feedthrough. Three LFP flights have been investigated for four modes (Normal, Normal LD, LASHE, and LASHE LD).

Additional debris model tapes have been requested. Flight data for low altitude and multiple RF signals are being investigated to provide additional clutter and electronic processing information.

A site dependency white paper has been completed and will be submitted to the project office.

PROBLEMS

None

WORK PLANNED

- o Continue Detector Modeling
- o Continue RF Simulation Clutter Investigation
- o Continue Digital, RFSS, and Flight Data Comparisons
- o Continue LD Investigation
- o Support RFSS Testing
- o Continue Site Dependency/Clutter Investigation

Cost Information

The following charges have been incurred against the contract during period January 1 through January 31, 1981.

	Expended	Encumbered
Personal Services (PS)	$ 19,677.19	$ -0-
Materials and Supplies	1,541.97	-5,245.26
Travel	559.87	520.00
Retirement (@ 11.59% of PS)	1,845.76	-0-
Overhead (@ 55% of above categories)	12,993.63	-0-
TOTAL	$ 36,618.42	$ -4,725.26

The breakdown of personal services is as follows:

	Dollars	Approximate Man Hours
Principal Research Scientists/Engineers	$ -0-	-0-
Senior Research Scientists/Engineers	9,722.80	458
Research Scientists II/Engineers II	3,101.21	184
Research Scientists I/Engineers I	2,942.04	218
Technicians/Draftsmen	-0-	-0-
Students	3,751.71	610
Secretarial/Clerical/Other	159.43	22
TOTAL	$ 19,677.19	1492

The current financial status of the contract is as follows:

	Budget As Proposed	Expended	Encumbered	Free Balance
Personal Services (PS)	$ 60,440.02	$ 34,265.80	$ -0-	$ 26,174.22
Materials and Supplies	664.50	15,689.94	14,742.37	-29,767.81
Travel and Shipping	10,000.00	1,727.80	520.00	7,752.20
Overhead	42,581.00	30,154.98	-0-	12,426.02
Retirement	6,314.48	3,143.71	-0-	3,170.77
FUNDING	$ 120,000.00	$ 84,982.23	$ 15,262.37	$ 19,755.40

Based on present full funding, the funding and equivalent man hours are sufficient to complete the task. Approximately 71% of the proposed task has been completed.

A-2998

Monthly Technical Report No. 8
and
Monthly Cost and Performance Report No. 8

Report Period
February 1 through February 28, 1982

Report Prepared
March 18, 1982

SYSTEM ANALYSIS

J. D. Knight

Contract No. DAAH01-81-D-A003
Delivery Order No. 0022
Project No. A-2998

Effective Date: 7/21/81
Expiration Date: 7/31/82
Expiration Date: 9/30/82

Prepared for

U. S. Army Missile Command
Attn: DRSMI-IYB/Morris
Redstone Arsenal, Alabama 35898

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS PERIOD

RFSS tests with the guidance loop open were performed to determine the monopulse relationship for two simultaneous CW RF signals. Future investigations will include a CW and a noise RF signal. This data will be used for the digital simulation phase relationship and validation of digital modeling.

Don Lewinski (RAIL) has submitted a paper documenting results of the detector study. Additional RFSS detector simulations have been completed and the data are being analyzed.

RFSS threat simulation development is being supported. Additional low altitude flight data are being analyzed for additional debris modeling.

PROBLEMS

None

WORK PLANNED

- Continue Multiple RF Analysis
- Continue Threat Development and Analysis
- Continue Detector Modeling Validation
- Continue Flight Data Comparisons
- Continue LD Investigation
- Support RFSS Entries
- Continue Site Dependency/Clutter Investigation.

Cost Information

The following charges have been incurred against the contract during period February 1 through February 28, 1982.

	Expended	Encumbered
Personal Services (PS)	$ 2,903.04	$ -0-
Materials and Supplies	251.90	-191.37
Travel	522.81	-520.00
Retirement (@ 11.59% of PS)	28.76	-0-
Overhead (@ 55% of above categories)	2,038.58	-0-
TOTAL	$ 5,745.09	$ -711.37

The breakdown of personal services is as follows:

	Dollars	Approximate Man Hours
Principal Research Scientists/Engineers	$ -0-	-0-
Senior Research Scientists/Engineers	-0-	-0-
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	2,654.92	432
Secretarial/Clerical/Other	248.12	34
TOTAL	$ 2,903.04	466

The current financial status of the contract is as follows:

	Budget As Proposed	Expended	Encumbered	Free Balance
Personal Services (PS)	$ 60,440.02	$ 37,168.84	$ -0-	$ 23,271.18
Materials and Supplies	664.50	15,941.84	14,551.00	-29,828.34
Travel and Shipping	10,000.00	2,250.61	-0-	7,749.39
Overhead	42,581.00	32,193.56	-0-	10,387.44
Retirement	6,314.48	3,172.47	-0-	3,142.01
FUNDING	$ 120,000.00	$ 90,727.32	$ 14,551.00	$ 14,721.68

Based on present full funding, the funding and equivalent man hours are sufficient to complete the task. Approximately 76% of the proposed task has been completed.

A-2998

Monthly Technical Report No. 9
and
Monthly Cost and Performance Report No. 9

Report Period
March 1 through March 31, 1982

Report Prepared
May 11, 1982

SYSTEM ANALYSIS

J. D. Knight

Contract No. DAAH01-81-D-A003
Delivery Order No. 0022
Project No. A-2998

Effective Date: 7/21/81
Expiration Date: 7/31/82
Expiration Date: 9/30/82

Prepared for

U. S. Army Missile Command
Attn: DRSMI-IYB/Morris
Redstone Arsenal, Alabama 35898

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS PERIOD

Results of the monopulse RFSS tests were incorporated into the digital simulation.

Site Dependent reflectivities and ground RCS have been selected for the two sites being used for the RFSS simulations.

A white paper addressing site dependency was submitted to Jim Cole of the Project Office.

The detector papers defining the digital simulation modeling are being completed. The detector model has been updated in the digital simulation.

Low altitude flight data is being analyzed for additional debris modeling. In addition, the Raytheon model is being reviewed.

PROBLEMS

None

WORK PLANNED

- o Continue Multiple RF Analysis
- o Continue Threat Development
- o Continue Validation of Detector Models and Monopulse Relations
- o Continue Flight Data Comparisons
- o Continue LD and LU Investigations
- o Support RFSS Entries
- o Continue Site Dependency/Clutter Investigations
- o Final Report Initiated

Cost Information

The following charges have been incurred against the contract during period March 1 through March 31, 1982.

	Expended	Encumbered
Personal Services (PS)	$ 6,812.44	$ -0-
Materials and Supplies	3,043.43	- 3,000.00
Travel	1,262.89	753.00
Retirement (@ 11.59% of PS)	349.50	-0-
Overhead (@ 55% of above categories)	6,307.53	-0-
TOTAL	$ 17,775.77	$ - 2,247.00

The breakdown of personal services is as follows:

	Dollars	Approximate Man Hours
Principal Research Scientists/Engineers	$ -0-	-0-
Senior Research Scientists/Engineers	1,011.69	48
Research Scientists II/Engineers II	1,050.78	62
Research Scientists I/Engineers I	739.64	55
Technicians/Draftsmen	-0-	-0-
Students	3,805.19	619
Secretarial/Clerical/Other	205.12	28
TOTAL	$ 6,812.42	812

The current financial status of the contract is as follows:

	Budget As Proposed	Expended	Encumbered	Free Balance
Personal Services (PS)	$ 60,440.02	$ 43,981.26	$ -0-	$ 16,458.76
Materials and Supplies	664.50	18,985.27	11,551.00*	-29,871.77
Travel and Shipping	10,000.00	3,513.50	753.00	5,733.50
Overhead	42,581.00	38,501.09	-0-	4,079.91
Retirement	6,314.48	3,521.97	-0-	2,792.51
FUNDING	$ 120,000.00	$ 108,503.09	$ 12,304.00	$ - 807.09

Based on present full funding, the funding and equivalent man hours are sufficient to complete the task. Approximately 95% of the proposed task has been completed.

* Actual expense to be reduced.

A-2998

Monthly Technical Report No. 10
and
Monthly Cost and Performance Report No. 10

Report Period
April 1 through April 30, 1982

Report Prepared
June 14, 1982

SYSTEM ANALYSIS

J. D. Knight

Contract No. DAAH01-81-D-A003
Delivery Order No. 0022
Project No. A-2998

Effective Date: 7/02/81
Expiration Date: 9/30/81
Expiration Date: 7/31/82 (Mod 1)

Prepared for

U. S. Army Missile Command
Attn: DRSMI-IYBB/Koger
Redstone Arsenal, Alabama 35898

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS PERIOD

The Georgia Tech debris modeling was compared with Raytheon SO and FDOC. Most modeling fundamentals were the same. The Georgia Tech simulation will be updated to include the firing doctrine for the Phase III activity.

The Georgia Tech RF Simulation models and results were compared with Raytheon. Planned programs were reviewed with a position presented. Follow-up meetings in Huntsville and Washington will be attended.

Modeling activities for two sites have been completed, and delivered to the RFSS.

PROBLEMS

None

WORK PLANNED

- Complete Draft Final Report
- Update Digital Simulation With Additional Debris Modeling
- Complete RF Modeling

Cost Information

The following charges have been incurred against the contract during period April 1 through April 30, 1982.

	Expended	Encumbered
Personal Services (PS)	$ 734.25	$ -0-
Materials and Supplies	2,928.27	- 2,794.63
Travel	326.80	- 753.00
Retirement (@ 11.59% of PS)	-0-	-0-
SUBTOTAL	3,989.32	-0-
Overhead (@ 55% of above categories)	2,194.13	-0-
TOTAL	$ 6,183.45	$ - 3,547.63

The breakdown of personal services is as follows:

	Dollars	Approximate Man Hours
Principal Research Scientists/Engineers	$ -0-	-0-
Senior Research Scientists/Engineers	-0-	-0-
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	734.25	119
Secretarial/Clerical/Other	-0-	-0-
TOTAL	$ 734.25	119

The current financial status of the contract is as follows:

	Budget As Proposed	Expended	Encumbered	Free Balance
Personal Services (PS)	$ 60,440.02	$ 44,715.51	$ -0-	$ 15,724.51
Materials and Supplies	664.50	21,913.54	8,756.37 *	-30,005.41
Travel and Shipping	10,000.00	3,840.30	-0-	6,159.70
Overhead	42,581.00	40,695.22	-0-	1,885.78
Retirement	6,314.48	3,521.97	-0-	2,792.51
FUNDING	$ 120,000.00	$ 114,686.54	$ 8,756.37	$- 3,442.91

Based on present full funding, the funding and equivalent man hours are sufficient to complete the task. Approximately 96% of the proposed task has been completed.

* Actual expense will be reduced.

A-2998

Monthly Technical Report No. 11
and
Monthly Cost and Performance Report No. 11

Report Period
May 1 through May 31, 1982

Report Prepared
July 26, 1982

SYSTEM ANALYSIS

J. D. Knight

Contract No. DAAH01-81-D-A003
Delivery Order No. 0022
Project No. A-2998

Effective Date: 7/02/81
Expiration Date: 9/30/81
Expiration Date: 7/31/82 (Mod 1)

Prepared for

U. S. Army Missile Command
Attn: DRSMI-IYBB/Koger
Redstone Arsenal, Alabama 35898

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS PERIOD

A draft of the final report is being prepared.

Debris models have been updated.

RF models have been updated.

PROBLEMS

None

WORK PLANNED

- Complete Final Report

Cost Information

The following charges have been incurred against the contract during period May 1 through May 31, 1982.

	Expended	Encumbered
Personal Services (PS)	$ -0-	$ -0-
Materials and Supplies	-0-	-0-
Travel	-0-	-0-
Retirement (@ 11.59% of PS)	-0-	-0-
SUBTOTAL	-0-	-0-
Overhead (@ 55% of above categories)	-0-	-0-
TOTAL	$ -0-	$ -0-

The breakdown of personal services is as follows:

	Dollars	Approximate Man Hours
Principal Research Scientists/Engineers	$ -0-	-0-
Senior Research Scientists/Engineers	-0-	-0-
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	-0-	-0-
Secretarial/Clerical/Other	-0-	-0-
TOTAL	$ -0-	-0-

The current financial status of the contract is as follows:

	Budget As Proposed	Expended	Encumbered	Free Balance
Personal Services (PS)	$ 60,440.02	$ 44,715.51	$ -0-	$ 15,724.51
Materials and Supplies	664.50	21,913.54	8,756.37 *	-30,005.41
Travel and Shipping	10,000.00	3,840.30	-0-	6,159.70
Overhead	42,581.00	40,695.22	-0-	1,885.78
Retirement	6,314.48	3,521.97	-0-	2,792.51
FUNDING	$ 120,000.00	$ 114,686.54	$ 8,756.37	$- 3,442.91

Based on present full funding, the funding and equivalent man hours are sufficient to complete the task. Approximately 96% of the proposed task has been completed.

* Actual expense will be reduced.

A-2998

Monthly Technical Report No. 12
and
Monthly Cost and Performance Report No. 12

Report Period
June 1 through June 30, 1982

Report Prepared
July 26, 1982

SYSTEM ANALYSIS

J. D. Knight

Contract No. DAAH01-81-D-A003
Delivery Order No. 0022
Project No. A-2998

Effective Date: 7/02/81
Expiration Date: 9/30/81
Expiration Date: 7/31/82 (Mod 1)

Prepared for

U. S. Army Missile Command
Attn: DRSMI-IYBB/Koger
Redstone Arsenal, Alabama 35898

Prepared by

Georgia Institute of Technology
Engineering Experiment Station
Atlanta, Georgia 30332

WORK PERFORMED DURING THIS PERIOD

A draft of the final report is 30% complete. Additional analysis is being made of previous RFSS monopulse boresight error slopes.

PROBLEMS

None

WORK PLANNED

- Complete Final Report

Cost Information

The following charges have been incurred against the contract during period June 1 through June 30, 1982.

	Expended	Encumbered
Personal Services (PS)	$ (519.75)	$ -0-
Materials and Supplies	2,702.40	(2,700.00)
Travel	-0-	-0-
Retirement (@ 11.59% of PS)	-0-	-0-
SUBTOTAL	2,182.65	-0-
Overhead (@ 55% of above categories)	1,200.46	-0-
TOTAL	$ 3,383.11	$ (2,700.00)

The breakdown of personal services is as follows:

	Dollars	Approximate Man Hours
Principal Research Scientists/Engineers	$ -0-	-0-
Senior Research Scientists/Engineers	-0-	-0-
Research Scientists II/Engineers II	-0-	-0-
Research Scientists I/Engineers I	-0-	-0-
Technicians/Draftsmen	-0-	-0-
Students	-0-	-0-
Secretarial/Clerical/Other	-0-	-0-
TOTAL	$ -0-	-0-

The current financial status of the contract is as follows:

	Budget As Proposed	Expended	Encumbered	Free Balance
Personal Services (PS)	$ 60,440.02	$ 44,195.76	$ -0-	$ 16,244.26
Materials and Supplies	664.50	24,615.94	6,056.37 *	(30,007.81)
Travel and Shipping	10,000.00	3,840.30	-0-	6,159.70
Overhead	42,581.00	41,895.68	-0-	685.32
Retirement	6,314.48	3,521.97	-0-	2,792.51
FUNDING	$ 120,000.00	$ 118,069.65	$ 6,056.37 *	$ (4,126.02)

Based on present full funding, the funding and equivalent man hours are sufficient to complete the task. Approximately 97% of the proposed task has been completed.

* Actual expense will be reduced.